

ACCESSION #: 9701060101

LICENSEE EVENT REPORT (LER)

FACILITY NAME: Diablo Canyon Unit 1 PAGE: 1 OF 7

DOCKET NUMBER: 05000275

TITLE: Automatic Reactor Trip Due To A 12 kV Electrical Fault

EVENT DATE: 11/22/96 LER #: 96-017-00 REPORT DATE: 12/23/96

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:

50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: Cary Harbor-Senior Regulatory TELEPHONE: (805) 545-4348

Compliance Engineer

COMPONENT FAILURE DESCRIPTION:

CAUSE: B SYSTEM: EA COMPONENT: ISL MANUFACTURER: G080

REPORTABLE NPRDS: N

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On November 22, 1996, with Unit 1 in Mode 1 (Power Operation) at 100 percent power, an electrical fault in the 12 kV bus fed from Auxiliary Transformer 1-1 resulted in automatic reactor trip. Unit 1 was stabilized in Mode 3 (Hot Standby) in accordance with plant emergency procedures. A 4-hour, non-emergency report was made to the NRC at 1339 PST in accordance with 10 CFR 50.72 (b)(2)(ii).

The cause of the electrical fault was determined to be degradation of the 12 kV electrical bus polyvinyl chloride (PVC) insulating material (boots). Degradation of the PVC boots caused deterioration of bus duct materials, corrosion, and contamination of insulators that

led to an electrical arc damaging the circuit.

Immediate corrective action included replacement of all suspect PVC boots with Raychem tape for Unit 1 and evaluation of the 4 kV and 12 kV bus ducts for Unit 2.

Corrective action to prevent recurrence includes analysis of the failed components, evaluation of PVC boots as an insulation material for electrical buses, and planned inspections of suspect 4 kV and 12 kV buses.

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I. Plant Conditions

Unit 1 was in Mode 1 (Power Operation) at 100 percent power.

II. Description of Problem

A. Summary:

On November 22, 1996, at 1147 PST with Unit 1 in Mode 1 at 100 percent power an electrical fault in the 12 kV bus fed from Auxiliary Transformer 1-1 resulted in an automatic reactor trip [AB][RCT]. Unit 1 received a reactor trip from a main turbine trip initiated by the Unit Trip actuation circuitry. The Unit Trip was due to electrical protective relay actuation.

B. Background:

The Unit 1 main generator supplies 25 kV electrical power to the main transformers (25 kV to 500 kV) that are connected to the PG&E transmission system. The 25 kV system also supplies power to plant loads fed from Auxiliary Transformer 1-1 (25 kV to 12 kV) and Auxiliary Transformer 1-2 (25 kV to 4 kV) during

normal operation.

The 12 kV system is designed with voltage, frequency, and current protection sensing devices to protect the plant distribution system. Actuation of these protective relays will automatically transfer the power source of the 12 kV and 4 kV buses to the independent electrical bus fed from the 230 kV to 12 kV Startup Transformer 1-1.

The Unit Trip is a non-safety related plant protective feature initiated by sensed plant conditions that require prompt plant shutdown for operational safety. The Unit Trip initiates a main generator and turbine trip. A turbine trip provides an anticipatory trip input to the reactor protection system (RPS) that automatically trips the reactor in anticipation of a sudden loss of load.

The Auxiliary Transformer differential relays sense a phase to phase electrical fault in the 12 kV bus fed from Auxiliary Transformer 1-1. These relays initiate a Unit Trip and automatically transfer the 12 kV distribution bus to the alternate source of electrical power.

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C. Event Description:

On November 22, 1996, at 1147 PST, a fault occurred in the 12

kV ground fuse cabinet for the 12 kV bus feed from Auxiliary Transformer 1-1. The fault caused actuation of the Auxiliary Transformer 1-1 differential protective relay. This relay actuation initiated a Unit Trip which initiated transfer of in plant electrical load from Auxiliary Transformers 1-1 and 1-2 to the Startup Transformers 1-1 and 1-2. Consequently, the 12 kV buses D and E and 4 kV buses D, E, F, G, and H transferred to the 230 kV offsite startup power supply. The Unit Trip actuation also tripped the two 500 kV breakers, the main generator field breaker, and the main turbine. The main turbine trip initiated a reactor trip via the RPS.

Licensed plant operators in the control room responded in accordance with established emergency procedures, confirmed the reactor trip, verified proper engineered safety feature actuations, and initiated manual actions to stabilize the unit in Mode 3.

On November 22, 1996, at approximately 1148 PST, the site fire alarm was sounded due to reported smoke and fire in the Auxiliary Transformer area. At 1200 PST the plant Fire Brigade arrived at the Auxiliary Transformer area. The fire brigade members confirmed that the reported fire was not active. At 1220 PST the California Department of Forestry (CDF) and San Luis Obispo (SLO) Fire Battalion arrived at the site. At 1300

PST the CDF and SLO Fire Battalion were released from the site.

On November 22, 1996, at 1339 PST, a 4-hour non-emergency report in accordance with 10 CFR 50.72(b)(2)(ii) was made to the NRC.

On November 22, 1996, at 1535 PST, a pressurizer power operated relief valve (PORV) (pressure control valve PCV-474) momentarily lifted twice. Plant operators in the control room responded to control room alarms and selected an alternate pressure channel input to control mode terminating the condition. Due to the short open time of the PORV no significant pressurizer pressure, pressurizer level or pressurizer relief tank change resulted.

D. Inoperable Structures, Components, or Systems that Contributed to the Event:

None.

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E. Dates and Approximate Times for Major Occurrences:

1. November 22, 1996, at 1147 PST: Event date/discovery date: A Unit Trip was initiated due to a 12 kV electrical fault.
2. November 22, 1996, at 1148 PST: Site fire alarm was sounded due to a fire

reported in the

Auxiliary Transformer

1-1 area. At 1200 PST

Plant Fire Brigade

arrived and confirmed

no active fire

present. At 1220 PST

CDF and SLO Fire

Battalion arrived,

however, were not

needed and released at

1300 PST.

3. November 22, 1996, at 1339 PST: A 4-hour non-emergency

report in accordance

with 10 CFR

50.72(b)(2)(ii) was

made.

4. November 22, 1996, at 1535 PST: A PORV (PCV-474) lifted

twice.

F. Other Systems or Secondary Functions Affected:

None.

G. Method of Discovery:

The event was immediately apparent to plant operators due to

alarms and indications received in the control room.

H. Operator Actions:

Licensed plant operators in the control room responded in accordance with established emergency procedures, confirmed the reactor trip, verified proper engineered safety feature actuations, and initiated manual actions to stabilize the unit in Mode 3. Plant operators sounded the fire alarm and conservatively requested backup fire fighting support.

Licensed plant operators in the control room responded to control room alarms and indication of a channel (P-456) failure and PORV 474 lifting twice and

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selected the alternate pressure channel input (P-455 or 474) to control mode terminating the condition.

I. Safety System Responses:

1. The reactor trip breakers (JC)(BKR) opened.
2. The main turbine [TA][TRB] tripped (turbine stop valves closed).
3. The control rod drive mechanism [AA][DRIV] allowed the control rods to drop into the core.
4. The motor-driven auxiliary feedwater (AFW) pumps and the turbine-driven AFW pump started automatically and

delivered water to all steam generators as required.

5. Containment Fan Cooler Units, CFCU 1-1, 1-2, 1-3, 1-4, and 1-5 started in slow speed as required.

III. Cause of the Problem

A. Immediate Cause:

Unit 1 experienced a reactor trip due to auxiliary power protective relays sensing differential current between phases. This actuation initiated a Unit Trip that resulted in a reactor trip.

The immediate cause of the PORV 474 lifting was a failure of an Eagle 21 analog output (EAO) board for pressurizer pressure channel 456. This failure caused the analog output signal to momentarily exceed the lift setpoint and actuate the PORV twice for approximately 0.4 seconds and 1.1 seconds.

B. Root Cause:

The cause of this event has been determined to be the failure of non-safety related polyvinyl chloride (PVC) electrical insulating material (boots) installed during the Auxiliary Transformer 1-1 replacement during March 1996. The boots were found to be prematurely degraded. PG&E believes that the PVC material deteriorated quickly giving off an acidic gas between March and November that combined with moisture in the 12 kV bus duct, causing a heavy build up of corrosion products and

contamination on the 12 kV ground transformer fuse insulators.

The corrosion product buildup provided an

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electrical arc path that led to a phase to phase and/or phase to ground fault of the 12 kV bus fed from Auxiliary Transformer 1-1 to the plant 12 kV distribution system.

The root cause of the Eagle 21 EAO board failure will be determined by the manufacturer (Westinghouse) and reported, if applicable, under vendor criteria when failure analysis is completed.

IV. Analysis of the Event

A reactor trip from 100 percent power is a previously analyzed Final Safety Analysis Report Update, Chapter 15, Condition II event. The RPS responded as designed and initiated reactor trip from turbine trip initiated by the Unit Trip signal. The Unit Trip was initiated by an auxiliary power differential current relay actuation as required by design. The unit was stabilized in Mode 3 in accordance with approved plant procedures.

After review of previous reactor trip data, PG&E determined that the plant response was consistent with a Unit Trip function.

Thus, the health and safety of the public were not affected by this event.

V. Corrective Actions

A. Immediate Corrective Actions:

1. Electrical components damaged during the fault were replaced.
2. Suspect PVC boots were replaced with Raychem tape. Bus duct condition was inspected and evaluated before allowing Unit 1 to restart.
3. Bus duct condition was inspected and evaluated for Unit 2.
4. All similar PVC boots in warehouse stock have been placed on hold.
5. Eagle 21 EAO board was replaced and will be returned to the original manufacturer for failure analysis.

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B. Corrective Actions to Prevent Recurrence:

1. PG&E will evaluate the continued use of PVC boots as an insulation material for electrical buses and propose a change in the design to use non-PVC products.
2. PG&E will perform detailed analysis of the failed components and provide the results to the material supplier.
3. PG&E will perform detailed inspection of all 4 kV and 12 kV buses during the next scheduled refueling outage to

perform the work.

VI. Additional Information

A. Failed Components:

1. Electrical insulating boots supplied by General Electric
manufactured by subsupplier Plastic Dip Moldings, Inc.

Part Number: 0108B7758P003 and

0152C3901P010

2. Eagle 21 EAO board manufactured by Westinghouse Electric
Corporation.

Part Number: Eagle 21 - EAO-01 (Eagle 21 analog output
board)

B. Previous LERs on Similar Problems

None.

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PAGE 1 OF 2

Pacific Gas and Electric Company

Diablo Canyon Power Plant Robert P. Powers

P.O. Box 56 Vice President-Diablo Canyon

Avila Beach, CA 93424 Operations and Plant Manager

805/545-6000

December 23, 1996

PG&E Letter DCL-96-237

PG&E

U.S. Nuclear Regulatory Commission

ATTN: Document Control Desk

Washington, D.C. 20555

Docket No. 50-275, OL-DPR-80

Diablo Canyon Unit 1

Licensee Event Report 1-96-017

Automatic Reactor Trip Due to a 12 kV Electrical Fault

Dear Commissioners and Staff:

Pursuant to 10 CFR 50.73(a)(2)(iv), PG&E is submitting the enclosed licensee event report regarding an automatic reactor trip due to a 12 kV electrical fault.

This condition did not affect the health and safety of the public.

Sincerely,

Robert P. Powers

cc: Steven D. Bloom

L. J. Callan

Stanley C. Ketelsen

Kenneth E. Perkins

Michael D. Tschiltz

Diablo Distribution

INPO

Enclosure

N0002005/DDM/2246

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December 23, 1996

PG&E Letter DCL-96-237

U.S. Nuclear Regulatory Commission

ATTN: Document Control Desk

Washington, D.C. 20555

Docket No. 50-275, OL-DPR-80

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